FORM PTO-1390 (REV 11-2000) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
Mo-6412/WW-5516	
U S APPLICATION NO (If known, see 37 CFR 1 5)	
To Be Assigned 09/868834	
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE
PCT/EP99/09775	December 10, 1999
PRIORITY DATE CLAIMED	
December 23, 1998	

TITLE OF INVENTION EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE

APPLICANT(S) FOR DO/EO/US BECKMANN, Peter; BLUM, Thomas; KAUFER, Michael and BROCKMANN, Jurgen

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND or SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [ ] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information:

Abstract
Form PTO 1449
Drawings (3 sheets)

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
To Be Assigned 09/868834	PCT/EP99/09775	Mo-6412/WW-5516

21. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a (2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	12 -20 =	0	x $18.00	$ 0.00	
Independent claims	1 -3 =	0	x $80.00	$ 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	$ 0.00	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$ 0.00	
SUBTOTAL =				$ 860.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$ 0.00	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40.00	
TOTAL FEES ENCLOSED =				$ 900.00	
				Amount to be refunded:	$
				charged:	$

a. [ ] A check in the amount of $ _____ to cover the above fees is enclosed.

b. [X] Please charge my Deposit Account No. 13-3848 in the amount of $ 900.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-3848. A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

00157
PATENT TRADEMARK OFFICE

SIGNATURE

Aron Preis
NAME

29,426
REGISTRATION NUMBER

PATENT APPLICATION
Mo-6412
WW-5516

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION OF)
) PCT/EP99/09775
PETER BECKMANN ET AL)
)
SERIAL NUMBER: TO BE ASSIGNED)
)
FILED: HEREWITH)
)
TITLE: EASY-TO-PEEL HEAT-SEALING)
MULTILAYER FILM FROM)
COEXTRUDED, BIAXIALLY)
ORIENTED POLYPROPYLENE)
)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231
Sir:

This preliminary amendment is being filed concurrently with the subject patent application. Upon granting a Serial Number and filing date, please amend the subject patent application as follows.

"Express Mail" mailing label number ET146894988US
Date of Deposit June 20, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner of Patents and Trademarks, Washington, D.C. 20231
Donna J. Veatch
(Name of person mailing paper or fee)
(Signature of person mailing paper or fee)

Please amend the Application as follows.

IN THE SPECIFICATION:

Please replace the title on lines 1 and 2 of page 1 of the specification with the following.

--EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE--

Please insert the following between lines 2 and 5 on page 1 of the specification.

--CROSS REFERENCE TO RELATED PATENT APPLICATIONS

The present patent application claims the right of priority under 35 U.S.C. 119 and 35 U.S.C. 365 of International Application No. PCT/EP99/09775, filed 10 December 1999, which was published in German as International Patent Publication No. WO 00/39200 on 6 July 2000, which is entitled to the right of priority of German Patent Application No. 198 59 689.9, filed 23 December 1998.

FIELD OF THE INVENTION--

Please insert the following at line 9 on page 1 of the specification.

--BACKGROUND OF THE INVENTION--

Please insert the following at line 20 on page 2 of the specification.

--SUMMARY OF THE INVENTION--

Please insert the following between lines 8 and 10 on page 3 of the specification.

--BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a representation of, (a) a film, from which bar packaging can be prepared, having a continuous lateral lacquer strip, and (b) a film, from which cassette packaging can be prepared, having transversely arranged lacquer strips;

Fig. 2 is a representation of, (a) bar packaging prepared from a film having a continuous lacquer strip in the longitudinal direction, and (b) cassette packaging prepared from a film having transversely arranged lacquer strips; and

Fig. 3 is a representation of cups engraved by means of 60/1, 70/4, 80/1 and 70/1 gravure screens.

DETAILED DESCRIPTION OF THE INVENTION--

Please replace line 1 on page 12 of the specification with the following.

WHAT IS CLAIMED IS:

IN THE ABSTRACT:

Please add the following abstract on a separate page.

--EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE

ABSTRACT OF THE DISCLOSURE

A coextruded biaxially oriented polypropylene (BOPP) film having easy-to-peel (or easily reversible) sealing properties is described. The coextruded BOPP film has sealing areas to which there has been applied a thermoplastic lacquer in a screen-type pattern (e.g., by means of a gravure printing). The area to which the thermoplastic lacquer is applied, is free of inks. The applied thermoplastic lacquer is weakly sealable to coextruded BOPP films, and comprises: (i) at least one polyvinyl butyral (PVB) polymer; or (ii) at least one ethylene/vinyl acetate copolymer (EVA copolymer). Packages (e.g., bar and cassette packages) prepared from the BOPP films of the present invention are also described.--

A separate abstract page is included herewith.

IN THE CLAIMS:

Please add the following Claims 13 and 14.

--13. The film of Claim 1 wherein the lacquer is a PVB lacquer, which is applied at a dry application rate of 0.8 to 1.2 g/m^2.

14. The film of Claim 1 wherein the lacquer is an EVA copolymer lacquer, which is applied at a dry application rate of 1.0 to 1.5 g/m^2.--

Please replace Claim 1 with the following.

1. (Once Amended, Clean) A coextruded BOPP film with peelable sealing properties, wherein the film is printed in a sealing area which has been left ink-free with a thermoplastic lacquer in a screen-type pattern, which lacquer comprises one of: (i) at least one polyvinyl butyral (PVB); and (ii) at least one ethylene/vinyl acetate copolymer (EVA copolymer) as the feature-determining solid component, said thermoplastic lacquer being only weakly sealable to coextruded BOPP.

Please replace Claim 2 with the following.

2. (Once Amended, Clean) The film of Claim 1 wherein the lacquer used is only weakly sealable to unpretreated coextruded BOPP surfaces and contains polyvinyl butyral (PVB) as the determining solid component.

3. (Cancelled)

Please replace Claim 4 with the following.

4. (Once Amended, Clean) The film of Claim 1 wherein the lacquer is a PVB lacquer and is applied at a dry application rate of 0.1 to 1.7 g/m^2.

Please replace Claim 5 with the following.

5. (Once Amended, Clean) The film of Claim 1 wherein the lacquer is applied with defined partial coverage and with full-tone gravure depth.

Please replace Claim 6 with the following.

6. (Once Amended, Clean) The film of Claim 1 wherein the thermoplastic lacquer is sealable to unpretreated coextruded BOPP surfaces and comprises saponified ethylene/vinyl acetate copolymer as the feature-determining solid component.

Please replace Claim 7 with the following.

7. (Once Amended, Clean) The film of Claim 1 wherein the lacquer is an EVA copolymer lacquer and is applied at a dry application rate of 0.1 to 2.5 g/m^2.

8. (Cancelled)

Please replace Claim 9 with the following.

9. (Once Amended, Clean) The film of Claim 1 wherein the lacquer is applied by means of a screen which is one of uniform and variable over the length and width of the sealing area in order to meet differing seam strength requirements.

Please replace Claim 10 with the following.

10. (Once Amended, Clean) The film of Claim 1 wherein the film has an electrically pretreated side, and outside the sealing area, the film is printed on the electrically pretreated side by means of register-controlled gravure printing.

Please replace Claim 11 with the following.

11. (Once Amended, Clean) The film of Claim 1 wherein the lacquer of the ink-free sealing area is in the form of: (a) continuous strips on the edge of the film reel; or (b) of uniformly spaced transverse strips arranged transversely to the machine direction of the film reel.

Please replace Claim 12 with the following.

12. (Once Amended, Clean) A package produced from the film of Claim 1.

REMARKS

Claims in the case are 1-14, upon entry of the present amendment. Claims 13 and 14 have been added, Claims 1, 2, 4-7 and 9-12 have been amended, and Claims 3 and 8 have been canceled herein.

Claims 1, 2, 4-7 and 9-12 of the above-identified patent application have been amended as to form, for example, by introducing indefinite and definite articles, replacing "characterized in that" with --wherein--, and converting multi-dependent claims to singly dependent claims. Basis for added Claim 13 is found in original Claim 4, and at page 3, lines 27-28 of the specification. Basis for added Claim 14 is found in original Claim 7, and at page 3, lines 28-29 of the specification.

Page 1 of the application has been amended herein to introduce cross reference information. The cross reference information is presented in accordance with 37 C.F.R. 1.78(a)(2) (Federal Register / Vol. 65, No. 183 / Wednesday, September 20, 2000; Changes to Implement Eighteen-Month Publication of Patent Applications; Final Rule).

The title of the application has been changed to correspond with that of the related International Patent Publication No. WO 00/39200. The specification has been amended to include section headings. A brief description of the drawings has also been included in the specification. The heading of the claims section of the specification has been changed from "Patent Claims" to --WHAT IS CLAIMED IS:--. An abstract of the patent application is included herewith on a separate page.

The amendments presented herein do not represent the entry of new matter into the application. Applicants respectfully request entry of this preliminary amendment.

Respectfully submitted,

PETER BECKMANN
THOMAS BLUM
MICHAEL KÄUFER
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By _____
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VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION: (Marked-Up)

The following are additions and changes that have been made to the specification.

The title on lines 1 and 2 of page 1 of the specification has been amended as follows.

[Heat sealable multilayer film with peelable opening behaviour made from coextruded, biaxially oriented polypropylene]

EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE

The following has been inserted between lines 2 and 5 on page 1 of the specification.

CROSS REFERENCE TO RELATED PATENT APPLICATIONS

The present patent application claims the right of priority under 35 U.S.C. 119 and 35 U.S.C. 365 of International Application No. PCT/EP99/09775, filed 10 December 1999, which was published in German as International Patent Publication No. WO 00/39200 on 6 July 2000, which is entitled to the right of priority of German Patent Application No. 198 59 689.9, filed 23 December 1998.

FIELD OF THE INVENTION

The following has been inserted at line 9 on page 1 of the specification.

BACKGROUND OF THE INVENTION

The following has been inserted at line 20 on page 2 of the specification.

SUMMARY OF THE INVENTION

The following has been inserted between lines 8 and 10 on page 3 of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a representation of, (a) a film, from which bar packaging can be prepared, having a continuous lateral lacquer strip, and (b) a film, from which cassette packaging can be prepared, having transversely arranged lacquer strips;

Fig. 2 is a representation of, (a) bar packaging prepared from a film having a continuous lacquer strip in the longitudinal direction, and (b) cassette packaging prepared from a film having transversely arranged lacquer strips; and

Fig. 3 is a representation of cups engraved by means of 60/1, 70/4, 80/1 and 70/1 gravure screens.

DETAILED DESCRIPTION OF THE INVENTION

Line 1 on page 12 of the specification has been amended as follows.

[Patent Claims] WHAT IS CLAIMED IS:

IN THE CLAIMS: (Marked-Up)

The following are versions of the amended claims with markings to show changes made thereto in the present Preliminary Amendment.

1. (Once Amended, Marked-Up) A [C]coextruded BOPP film with peelable sealing properties, [characterised in that] wherein the film is printed in a sealing area which has been left ink-free with a thermoplastic lacquer in a screen-type pattern, which lacquer [contains] comprises one of: (i) at least one polyvinyl butyral (PVB); [or] and (ii) at least one ethylene/vinyl acetate copolymer (EVA copolymer) as the feature-determining solid component, [and is] said thermoplastic lacquer being only weakly sealable to coextruded BOPP.

2. (Once Amended, Marked-Up) The film of Claim 1 wherein [Films according to claim 1, characterised in that] the lacquer used is only weakly sealable to unpretreated coextruded BOPP surfaces and contains polyvinyl butyral (PVB) as

the determining solid component.

3. (Cancelled)

4. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to one of claims 1 to 3, characterised in that] the lacquer is a PVB lacquer and is applied at [an] a dry application rate [(dry)] of 0.1 to 1.7 g/m^2[, preferably of 0.8 to 1.2 g/m^2].

5. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to one of claims 1 to 4, characterised in that] the lacquer is applied with defined partial coverage and with full-tone gravure depth.

6. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to claim 1, characterised in that] the thermoplastic lacquer [used] is [thermoplastic and] sealable to unpretreated coextruded BOPP surfaces and [preferably contains] comprises saponified ethylene/vinyl acetate copolymer [synthetic resin (EVA copolymer)] as the feature-determining solid component.

7. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to claim 1 or 6, characterised in that] the lacquer is an EVA copolymer lacquer and is applied at [an] a dry application rate [(dry)] of 0.1 to 2.5 g/m^2[, preferably of 1.0 to 1.5 g/m^2].

8. (Cancelled)

9. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to one of claims 1 to 8, characterised in that the screen for application of] the lacquer is applied by means of a screen which is one of uniform [or] and variable over the length and width of the sealing area in order to meet differing seam strength requirements.

10. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to one of claims 1 to 9, characterised in that,] the film has an electrically pretreated side, and outside the sealing area, the film is printed on the electrically pretreated side by means of register-controlled gravure printing.

11. (Once Amended, Marked-Up) The film of Claim 1 wherein [Film according to one of claims 1 to 10, characterised in that the ink-free sealing areas provided with] the lacquer of the ink-free sealing area [assume] is in the form of: (a) continuous strips on the edge of the film reel; or (b) of uniformly spaced transverse strips arranged transversely to the machine direction of the film reel.

12. (Once Amended, Marked-Up) A package [Packages] produced from [a] the film [according to one of claims 1 to 11] of Claim 1.

13. (Added) The film of Claim 1 wherein the lacquer is a PVB lacquer, which is applied at a dry application rate of 0.8 to 1.2 g/m^2.

14. (Added) The film of Claim 1 wherein the lacquer is an EVA copolymer lacquer, which is applied at a dry application rate of 1.0 to 1.5 g/m^2.

EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE

ABSTRACT OF THE DISCLOSURE

A coextruded biaxially oriented polypropylene (BOPP) film having easy-to-peel (or easily reversible) sealing properties is described. The coextruded BOPP film has sealing areas to which there has been applied a thermoplastic lacquer in a screen-type pattern (e.g., by means of a gravure printing). The area to which the thermoplastic lacquer is applied, is free of inks. The applied thermoplastic lacquer is weakly sealable to coextruded BOPP films, and comprises: (i) at least one polyvinyl butyral (PVB) polymer; or (ii) at least one ethylene/vinyl acetate copolymer (EVA copolymer). Packages (e.g., bar and cassette packages) prepared from the BOPP films of the present invention are also described.

Heat sealable multilayer film with peelable opening behaviour made from coextruded, biaxially oriented polypropylene

The present invention relates to biaxially oriented, heat sealable, coextruded polypropylene films which are provided by printing during inside-against-outside sealing with a tear-free openable (peelable) longitudinal seam, and to the use thereof for the production of packaging.

Heat sealable packaging films and the use thereof for full wrapping with envelope folds on the end faces and an overlapping longitudinal seam (Fig. 2) have long been known. Plain films without a surface finish, the overlapping sealed longitudinal seams of which may be opened peelably given appropriate settings for sealing temperature, pressure and time have likewise also long been known. Examples which may be mentioned are nitrocellulose lacquer coated cellulose films and acrylic lacquer coated, biaxially oriented polypropylene film (BOPP). Coextruded heat sealable BOPP films, which are preferably used due to lower packaging costs, fail in this respect due to excessively strong sealing or an excessively small temperature range with a sufficiently low seal strength for such applications.

Peelable packages may be produced from BOPP films by providing a cold seal (CS) finish in order to achieve elevated packaging speeds on horizontal form/fill/seal machines. However, this CS technology is not feasible for the full wrap package with envelope folds and a longitudinal seam with outside-against-inside sealing, as shown in Fig. 2, as CS compositions can only be sealed to themselves and may thus only be considered for the inside-against-inside sealed longitudinal and transverse seams of tubular bag packages.

Tear strips offer another option for moderating the deficiency of more difficult opening characteristics of packages made from coextruded BOPP films and one already industrially implemented application, as described in EP 0 577 509 B1,

attenuates the seal strength of the plain film, rendering it unreliable by printing the sealing zones with a sealing-resistant screen-type pattern, such that only the additional use of a tear strip results in the desired opening behaviour fully exposing the package contents. This in particular applies if the finished packages are subjected to thermal post-treatment to improve package appearance resulting in the projecting tab of the tear strip becoming uncontrollably bonded with the wrapping material, so impairing its function as an aid to opening.

The possibility of cancelling out or, in the event of partial coverage, moderating the heat sealability of sealable plain films by means of sealing-resistant lacquers or printing inks is known, but in practice is subject to major, unacceptable variations determined by the natural tolerances of the plain film properties, printing conditions and application weights. The action of such sealing-resistant systems based on sparingly plasticised nitrocellulose or two-component polyurethanes is determined by their spacing function, which is permanent even on exposure to heat and, in principle, deliberately reduces sealing contact (area and pressure) of exposed coextruded BOPP surfaces. Moreover, there is the risk, which cannot reliably be avoided in gravure printing, that the desired residual seal strength of the plain film will be negated by "scumming" (application of ink to unwanted areas).

The object accordingly arises of reliably providing low cost, coextruded BOPP films, which as a result of their production process exhibit unsuitably strong sealing properties, with the desired peelable sealing properties in the course of the printing process without the stated disadvantages, such that packages produced therefrom, preferably full wrap packages according to Fig. 2, may be opened without a tear strip sufficiently easily and as far as possible without tearing and that seal strength is largely kept constant over a wide tolerance range allowing for technically unavoidable raw material variations as well as variations in printing conditions, sealing temperatures and application weights.

This has been achieved according to the invention by printing conventional commercial, coextruded BOPP films by means of register-controlled gravure

printing, preferably on the electrically pretreated side in a sealing area which has been left ink-free, with a thermoplastic lacquer in a screen-type pattern, which lacquer is itself only weakly sealable to coextruded BOPP and contains at least one polyvinyl butyral (PVB) or at least one ethylene/vinyl acetate copolymer (EVA copolymer) as the feature-determining component. This specific selection of the lacquer ensures that the spacing action progressively declines as softening proceeds with rising temperatures and increasingly permits the coextruded BOPP surfaces to come into sealing contact.

Seal strength and peeling behaviour in inside-against-outside sealing (a/b sealing) may purposefully be controlled by the design of the screen used during printing.

Particularly suitable screens are shown in Table 3. It is possible here both to provide a uniform screen over the length and width of the sealing area and to provide, within the possibilities of the gravure process, a variable screen over the length and/or width of the sealing area in order to met specific requirements with regard to seam strength and/or peel behaviour. In accordance with the described screening, the lacquer is applied with partial coverage and preferably with full-tone gravure depth.

The lacquer used comprises conventional commercial ink/lacquer systems with polyvinyl butyrate (PVB), as widely used for reverse printing on coextruded BOPP surfaces (e.g. 15-020613-4, series MX 31, Siegwerk) or ethylene/vinyl acetate copolymers (EVA copolymer, e.g. 10-612764-0 W, Siegwerk) as the feature-determining solid component. It is also possible to use mixtures of two or more PVB lacquers or two or more EVA copolymer lacquers.

The (dry) lacquer application rate for PVB lacquers is preferably 0.1 to 1.7 g/m^2, in particular 0.8 to 1.2 g/m^2. The (dry) lacquer application rate for EVA copolymer lacquers is preferably 0.1 to 2.5 g/m^2, in particular 1.0 to 1.5 g/m^2.

The film according to the invention preferably comprises a coextruded BOPP film which has been printed by register-controlled gravure printing on the electrically pretreated side outside the sealing areas which have been left ink-free.

Coextruded BOPP films, which as plain films exhibit excessively strong seals which tear on separation, may be obtained in a form exhibiting weaker and peelable seals by means of the print finish according to the invention.

It was not to have been expected either that an ethanol-thinnable PVB lacquer printed according to the invention would seal sufficiently strongly to unpretreated coextruded BOPP or, when a water-thinnable EVA copolymer lacquer was used, that no unwanted material tearing on separation of the seam would start from the remaining lacquer-free seal points on the coextruded surface, despite a sufficiently strong seal, but that instead tear-free peeling would occur in both cases and that it would be possible to dispense with tear strips as an aid to opening.

The film according to the invention is preferably produced by multipurpose printing of conventional commercial, largely standardised, coextruded BOPP films by gravure or flexographic printing, preferably on conventional multicolour gravure presses with register control using engraved cylinders with cells, wherein front or reverse printing inks suitable for coextruded BOPP are used in combination with one of the lacquers according to the invention in the ink-free area. The film is then finally cut in accordance with customer requirements on conventional commercial roll cutting machines with lateral edge control. The arrangement of the ink-free areas is determined by the type of package which is to be produced from the coextruded BOPP film. Preferred ink-free areas are those according to Fig. 1 which are arranged as continuous strips along both edges of the reel in machine direction or as uniformly spaced transverse strips arranged transversely to the machine direction of the reel.

The present invention also provides packages produced from the films according to the invention, in particular full wrap packages which have no additional tear aids and which may easily be opened without tearing.

The following Examples are intended to illustrate the invention in greater detail.

The properties of relevance to the intended purpose of the films according to the invention are determined by testing low pressure seal strength (LPSS) over a temperature range compatible with the film (sealing curve) in order to evaluate their suitability for wrapping applications.

Low pressure seal strength is the force in N, relative to the test strip width of 15 mm, which is required to separate a seal seam produced under defined conditions (pressure, temperature, time).

Sealing conditions: Pressure 0.35 N/cm², time 0.5 sec, temperature 105 to 150°C in 5 Kelvin intervals.

Measuring devices: Low pressure sealer from Brugger, with 20*50 mm² sealing bars, sized, 5 instances at different temperatures. 5 instances with counterweights of a bearing area of 25*30 mm² to which 2 to 3 mm thick felt has been stuck.

Test strip cutter: cutting width 15 mm. Tensile tester with 10 N measurement range and draw speed of 100 mm/min.

Qualitative evaluation: In addition to a value of >0.5 N/15 mm, which may be considered acceptable for practical wrapping purposes, as an essential condition, tear-free, peeling separation according to the invention was included in the evaluation as a sufficient condition and the temperature range exhibiting the desired sealing behaviour was determined (Table 1). It is found that sealing values of

>1.5 N/15 mm give rise to unwanted tearing of the material on separation of the seam.

Example 1

LPSS values, outside-against-inside, of between 0.5 and 1.5 N/15 mm were achieved from temperatures of 125°C with tear-free separation by multicolour reverse gravure printing onto the electrically pretreated side (subsequently inside of package) of a conventional commercial 20 µ gauge coextruded BOPP film (Walothen® C20EHS from Wolff Walsrode AG) with widely used ethanol-thinnable polyvinyl butyral inks (PVB) in the decorative area and polyvinyl butyral lacquer (15-020613-4, series MX 31 from Siegwerk Druckfarben GmbH & Co. KG) in the ink-free longitudinal seam area using various conventional gravure screens, 60/1, 70/1, 70/4 and 80/1 (Table 2). Depending upon the screen, the width of the usable temperature range varies and, in the case of preferred forms (60/1 and 70/4), entails precise temperature control of the sealing tools in the wrapping plant (Table 1).

Example 2

By replacing the PVB lacquer used in Example 1 with a commercial water-thinnable sealing lacquer based on an aqueous dispersion of saponified synthetic resins (ethylene/vinyl acetate copolymer) in the form of sealing lacquer 10-612764-0W from Siegwerk Druckfarben GmbH & Co. KG, which has proven sealability to unpretreated coextruded BOPP, it proved possible to achieve the desired LPSS values of between 0.5 and 1.5 N/15 mm and peeling separation behaviour over a wide temperature range (Table 1).

Comparative Example 1

In comparison with Examples 1 and 2, the LPSS (a/a) of the unpretreated, unprinted plain film at a value of = 2.5 N/15 mm is too high and it is not possible to separate the seam without tearing (Table 1).

Comparative Example 2

The LPSS (a/b) of the unpretreated side against the pretreated side of the unprinted plain film likewise does not exhibit a usable temperature profile. Although, as expected, the values are lower than the LPSS (a/a) in Comparative Example 1, the temperature range with seal strengths of 0.5 to 1.5 N/15 mm, which permit tear-free separation, is too narrow (Table 1).

Comparative Example 3

By way of comparison with the prior art, the desired low LPSS values are frequently, but not reliably, achieved by multicolour reverse gravure printing on a film as described in Example 1 but of a gauge of 25 µ with various ink systems depending upon the application, such as ethanol-thinnable polyvinyl butyral based ground metal ink, ethanol/ethyl acetate-thinnable NC based coloured inks, ethyl acetate-thinnable two-component NC ester white ink in the decorative area and two-component PU lacquer (sealing-resistant) as the screen (Table 3, Y) in the ink-free longitudinal seam zone. In some cases, the seal was inadequate in the temperature range of 125 to 135°C, which is of particular practical relevance (Table 1). This result reflects the unsatisfactory nature of the prior art.

Table 1: Low pressure sealing results from the Examples

Example	1				2			Comparative Example 1	Comparative Example 2	Comparative Example 3
Gravure screen	60/1	70/4	80/1	70/1	Squares, approx. 10% coverage	Squares, approx. 50% coverage	Squares, approx. 90% coverage	Plain film	Plain film	Squares, approx. 50% 2-component lacquer
LPSS N/15 mm	a/b	a/b	a/b	a/b	a/bx	a/by	a/bz	a/a	a/b pretreated	a/by
110°C	0	0	0	0	0	0	0	0	0	0
115°C	0	0	0	0	0	0	0	0.4	0.5	0
120°C	0.2	0.2	0.2	0.3	0.2	0.3	0.3	1.4	0.9	0
125°C	1.1	1.3	0.7	0.8	0.5	0.6	0.5	2.9	1.0	0
130°C	1.5	1.5	1.3	1.9	0.6	0.8	0.6	2.9	2.1	0
135°C	1.5	1.4	1.8	1.7	0.6	0.6	0.5	2.7	2.2	0.2
140°C	2.3	1.8	1.8	2.1	0.6	0.8	0.8	2.8	2.1	0.3
145°C	2.1	1.9	2.0	2.3	1.2	1.2	0.9	2.7	2.2	0.6
150°C	-	-	-	-	1.6	1.5	1.1	-	2.3	1.2

Sealing values of 0.5 to 1.5 N/15 mm (grey background), usable range with tear-free seam separation (verification)

a/a = unprinted side of film sealed to itself (blank test)

a/b = unprinted side of film against side finished according to the invention (typical sealing for wrapped packages)

a/b prt. (electrically pretreated), without influence of printing ink

Crosshatched line, 150°C = severe shrinkage due to overheating of films

Table 2: Characterisation of printing cylinders used (gravure printing with HelioKlischograph manufactured by Hell)

Gravure screen	60/1 (Example 1)	70/4 (Example 1)	80/1 (Example 1)	70/1 (Example 1)	70/0 (Example 2)
Cells/cm	60	70	80	70	70
Screen angle	1	4	1	1	0
Transverse diagonal (µ)	172	108	129	146	180
Puncture (µ)	22	16	18	22	22

Table 3: Explanation of squares in Table 1, Example 2 and Comparative Example 3, and of differentiation into zones X, Y and Z, with uniform 70/0 gravure screen

X	Y	Z
6:1	6:1	10:1 magnified

Dimensions in mm, dark areas are printed.

Patent Claims

1. Coextruded BOPP film with peelable sealing properties, characterised in that the film is printed in a sealing area which has been left ink-free with a thermoplastic lacquer in a screen-type pattern, which lacquer contains at least one polyvinyl butyral (PVB) or at least one ethylene/vinyl acetate copolymer (EVA copolymer) as the feature-determining solid component and is only weakly sealable to coextruded BOPP.

2. Films according to claim 1, characterised in that the lacquer used is only weakly sealable to unpretreated coextruded BOPP surfaces and contains polyvinyl butyral (PVB) as the determining solid component.

3. Film according to claim 1 or 2, characterised in that the lacquer used is a mixture of conventional commercial PVB lacquers, as are widely used for reverse printing on coextruded BOPP.

4. Film according to one of claims 1 to 3, characterised in that the lacquer is applied at an application rate (dry) of 0.1 to 1.7 g/m^2, preferably of 0.8 to 1.2 g/m^2.

5. Film according to one of claims 1 to 4, characterised in that the lacquer is applied with defined partial coverage and with full-tone gravure depth.

6. Film according to claim 1, characterised in that the lacquer used is thermoplastic and sealable to unpretreated coextruded BOPP surfaces and preferably contains saponified synthetic resin (EVA copolymer) as the feature-determining solid component.

7. Film according to claim 1 or 6, characterised in that the lacquer is applied at an application rate (dry) of 0.1 to 2.5 g/m^2, preferably of 1.0 to 1.5 g/m^2.

8. Film according to one of claims 1, 6 or 7, characterised in that the lacquer is applied with defined partial coverage and with full-tone gravure depth.

9. Film according to one of claims 1 to 8, characterised in that the screen for application of the lacquer is uniform or variable over the length and width of the sealing area in order to meet differing seam strength requirements.

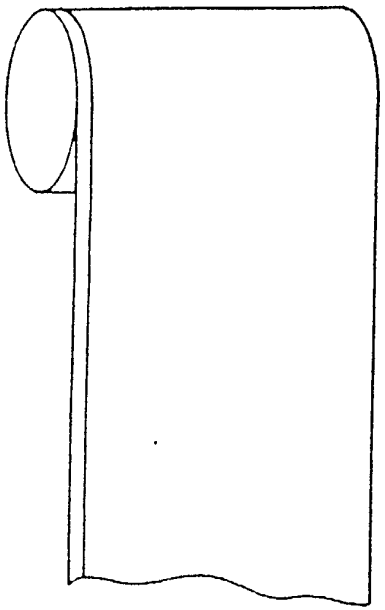
10. Film according to one of claims 1 to 9, characterised in that, outside the sealing area, the film is printed on the electrically pretreated side by means of register-controlled gravure printing.

11. Film according to one of claims 1 to 10, characterised in that the ink-free sealing areas provided with the lacquer assume the form of continuous strips on the edge of the film reel or of uniformly spaced transverse strips arranged transversely to the machine direction of the film reel.

12. Packages produced from a film according to one of claims 1 to 11.

Fig. 1

Bar packaging, continuous lateral special laquer strip



Cassette packaging, register-controlled transversely arranged strips

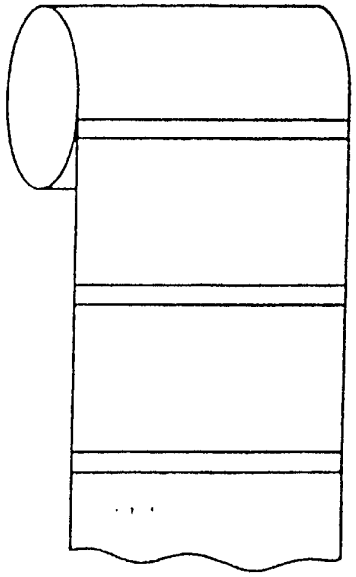


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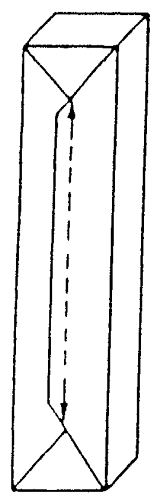
Fig. 2

Bar packaging from film with continuous special lacquer strip in the longitudinal direction



Cassette packaging from film with special lacquer arranged transversely to the longitudinal direction

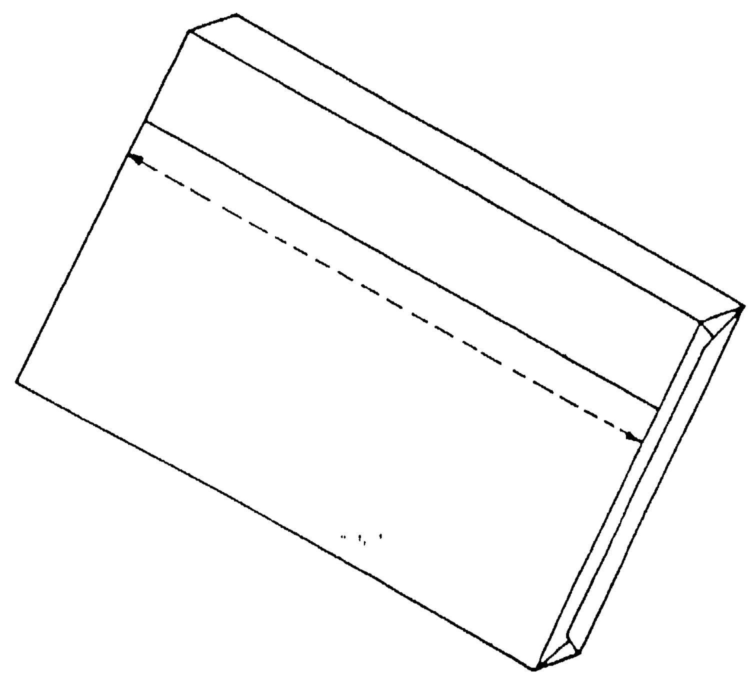
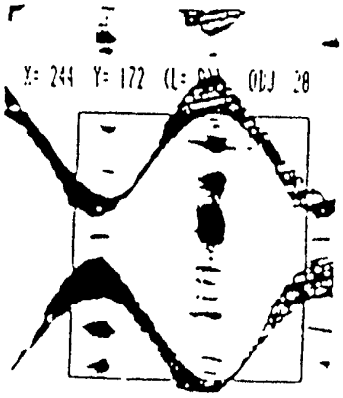


Fig. 3

Engraved cups



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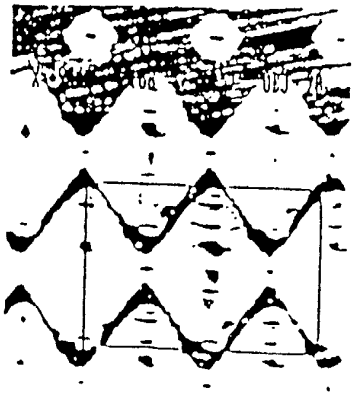

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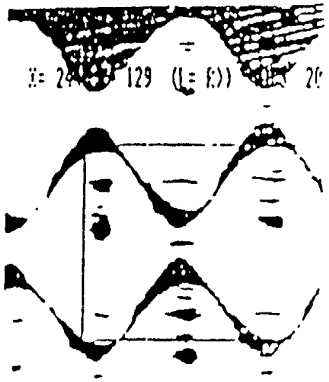
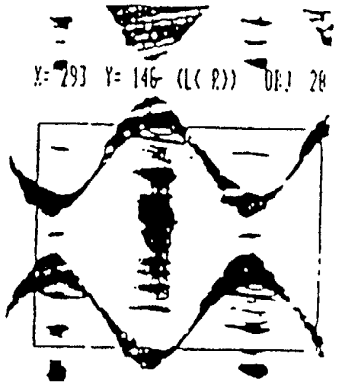


80/1



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COMBINED DECLARATION AND POWER OF ATTORNEY	ATTORNEY DOCKET NO

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought
on the invention entitled

EASY-TO-PEEL HEAT-SEALING MULTILAYER FILM FROM COEXTRUDED, BIAXIALLY ORIENTED POLYPROPYLENE

the specification of which is attached hereto,

or was filed on **December 10,1999** ✓

as a PCT Application Serial No. **PCT/EP 99/09775** ✓

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s), the priority(ies) of which is/are to be claimed:

198 59 689.8 ✓	**Germany** ✓	**December 23,1998** ✓
(Number)	(Country)	(Month/Day/Year Filed)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose the material information as defined in Title 37, Code of Federal Regulations, §1.56 which occured between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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